

TRANSPORTATION

ABSTRACT This paper presents a strategic-level examination of the transportation industry – an industry vital to national prosperity and security. Because the defense sector relies on commercial transportation for both peacetime activities and for power projection, senior military leaders must understand the global transportation industry and the environment in which the private sector operates. They must also assess the role of government in determining transportation policy, as federal, state and local agencies regulate every mode of this industry. While the U.S. transportation industry functions well today, the industry must address several challenges, particularly in light of forecasts that global trade will double by 2020. Issues common across all modes of transportation include the growth of intermodal transport, the capital-intensive nature of the industry structure, the need to carefully focus technological investment, planning for infrastructure capacity, replacing an aging workforce, and coping with uncertain fuel costs. As the economy recovers from the recession of the past few years, transportation executives generally feel that “business is good.” Orders for shipments have increased significantly, and transportation demands often serve as a barometer for overall economic health. Security concerns following the terrorist attacks of September 11 require transportation leaders to regularly conduct risk assessments and provide additional security when warranted. These initiatives have been prudently balanced with the need to provide reliable, cost-effective transportation to fuel the economic engine of the U.S.

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JetBlue, New York City, New York
Transportation Security Administration, John F. Kennedy Airport, New York
U.S. Coast Guard Activity New York, New York City, New York
J.P. Morgan, New York City, New York
Amtrak, New York City, New York and Wilmington, Delaware
Amtrak Headquarters, Washington D.C.
Association of American Railroads, Washington, D.C.
American Short Line and Regional Railroad Association, Washington, D.C.
Delta Air Lines, Atlanta, Georgia
Federal Aviation Administration, Herndon, Virginia
Military Sealift Command, Washington, D.C.
Overnite Transportation Company, Richmond, Virginia
U.S. Department of Transportation, Washington, D.C.
American Trucking Associations
Northwest Airlines
American Maritime Congress
Association of Oil Pipelines
Surface Deployment and Distribution Command

International

Flower Auction Aalsmeer, Aalsmeer, Netherlands
KLM Airlines/Northwest Airlines, Amstelveen, Netherlands
Heineken Brewery, Zoeterwoude, Netherlands
Dutch Customs, Maasvlakte, Netherlands
ECT Delta Automated Terminal, Maasvlakte, Netherlands
Rotterdam Port Authority, Rotterdam, Netherlands
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Bureau Voorlichting Binnenvaart (Inland Waterways/Barges), Rotterdam, Netherlands
United States Mission to the European Union, Brussels, Belgium
NATO Headquarters – United States Military Mission, Brussels, Belgium
Normandy Beaches, France
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United Kingdom Ministry of Defense Strategic Transportation, London, United Kingdom
General Electric/Sea Container Lines, London, United Kingdom
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Baltic Exchange, London, United Kingdom
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INTRODUCTION

The transportation industry is vital to national prosperity and security. It moves people and goods, employs millions of workers, generates billions of dollars in revenue, and consumes resources and services produced by other sectors of the economy. All the world's major economic and military powers have extensive transportation systems. Consequently, strategic decision-makers must understand the transportation industry and the environment in which they compete.

The United States transportation system combines a staggering number of vessels and vehicles with an extraordinarily complex infrastructure. On any given day, commercial aircraft fly 24,000 flights out of 429 major airports. Nearly 8 million trucks haul loads on a 4 million mile road network. Some 1.5 million rail cars operate on 171,000 miles of track. Gas and oil flow through 1.5 million miles of pipeline. Ships and barges travel on 26,000 miles of domestic waterways, and 300 major seaports receive tens of thousands of containers carrying 76 percent of our imported goods. Moreover, the industry employs a labor force of about 10 million people and contributes over 11 percent to the United States Gross Domestic Product (GDP).ⁱ It is apparent that transportation has a huge impact on our social and economic prosperity.

This paper presents the results of our collective study of the transportation industry. After defining the industry in terms of each of the five different modes – shipping, trucking, railroads, air, and pipelines – it presents current conditions, challenges, outlook, and government roles and regulations. Also included are three essays on subjects current to the industry: Aviation Treaties, Short Sea Shipping, and Tanker-Civil Reserve Air Fleet (CRAF). Given what we learned firsthand from government and private industry leaders, and the fact that private industry has satisfied national welfare and security needs over the last several years, we conclude that the U.S. transportation industry is generally in good health and should remain so for the foreseeable future.

THE INDUSTRY DEFINED

The transportation industry consists of five primary modes—shipping, trucking, rail, air, and pipeline—that move various combinations of cargo and passengers.

Shipping: Shipping generally focuses on ocean transport, dominated by companies such as Maersk/Sealand and American President Lines, and inland waterway and domestic shipping lines that operate barges and smaller vessels.

Trucking: The trucking sector includes both truckload carriers (TL) that deliver full truck loads for large shippers, and less than truckload (LTL) carriers that deliver small loads using a hub and spoke distribution system. There are over 650,000 trucking companies in the United States, 80 percent of which own 6 trucks or less.

Rail: The railroad sector encompasses both freight and passenger railroads. Amtrak provides nationwide passenger service while numerous public and private lines provide inter-city and intra-city commuter service. Four large railroads dominate freight traffic, while numerous short-line railroads connect with the trunk rail systems to complete the network.

Air: Air transportation includes legacy carriers such as Delta Airlines and United Airlines, low cost carriers (LCCs) such as Southwest Airlines and JetBlue, and air cargo carriers such as Federal Express and United Parcel Service. LCCs generally fly point-to-point routes between large cities while the legacy carriers employ a hub and spoke system that provides full service customer support.

Pipeline: A robust pipeline system safely and efficiently transports the bulk of petroleum products, natural gas, and chemicals throughout the United States.

CURRENT CONDITION

Shipping: Global shipping is on a cyclical upswing due to booming Chinese trade and recent economic growth in much of the rest of the world. Increased demand for oil and the growth of free-trade agreements magnify this upswing. Shipping companies manage this growth by purchasing larger ships and seeking ports with greater offload capacity—often necessitating terminal growth and harbor dredging. The steady growth of container traffic drives the expansion of the rail and road intermodal networks to expedite the flow of goods inland. One important example is the recent completion of the \$2.4 billion Alameda Corridor project that links the ports of Los Angeles and Long Beach to transcontinental rail lines, greatly expanding the throughput of those ports.

In contrast to the growth of global shipping, inland waterway use has declined by 30 percent over the past 10 years, due primarily to the convenience of other modes such as trucks and railroads. While traffic congestion and pollution concerns make inland shipping attractive, the system's limited waterway network and the expense of infrastructure improvements hamper expansion.

The privately-owned U.S. merchant fleet has decreased by half over the past 10 years, significantly increasing our reliance on foreign flag vessels. Currently, only about 4 percent of U.S. exports and imports are carried by U.S. flagged vessels. Foreign built and operated ships offer shippers lower operating and maintenance costs at the expense of the U.S. maritime industry. Government programs and policies such as the Jones Act, Maritime Security Program, and Cargo Preference Act help ensure that a small number of U.S. flagged vessels remain in service.

Trucking: Trucking plays a vital role in the transport of goods as the only mode that serves most communities in the United States. The sheer magnitude of trucks serves to dominate many aspects of transportation services; in 2003, trucks moved almost 70 percent of the domestic freight, totaling 9.1 billion tons of cargo.

Trucking companies face stiff competition that results in low profit margins of about 2 to 4 percent. Low barriers to entry and exit result in numerous trucking company start-ups and failures each year, making for a dynamic and ever changing landscape. In addition, the industry has seen many mergers as companies fight to gain competitive advantage. Despite these low profit margins, the industry has continued to prosper because of improving economic conditions based on personal consumption, business orders, and reduced inventory quantities. As with the other transportation sectors, rapidly rising fuel prices escalate operating costs, particularly for small carriers operating on slim profit margins.

Rail: The freight railroad sector is strong and meets the nation's current demands for rail service. Four major companies move over 85 percent of all rail freight traffic in the United States. Union Pacific and Burlington Northern/Santa Fe (BNSF) operate west of the Mississippi River while CSX and Norfolk Southern dominate the East. However, future capacity expansion is difficult due to the high cost of infrastructure and limited availability of land. The rapid expansion of intermodal operations and the growth of traffic at United States ports are providing both challenges and opportunities to this sector.

Amtrak, the nation's long-distance passenger rail carrier and a public corporation, continues to operate at a deficit despite significantly improved operations and record levels of ridership. Of much greater importance to the U.S. economy is the growing commuter rail and subway systems that relieve highway congestion, reduce pollution, and serve people who don't have access to personal vehicles.

Security concerns within the railroad sector continue to increase, highlighted by the terrorist bombing in Madrid, Spain in March 2004 which killed nearly 200 people. New technology is being tested for eventual passenger screening, but securing thousands of miles of track, thousands of rail stations, and high density commuter traffic requires massive funding that must be prioritized.

Air: Passenger air continues to recover from several events that occurred between 2000 and 2003. Recession in the United States, the September 11 terrorist attacks, the SARS epidemic, the war in Iraq, and the growth of LCCs caused a so-called "perfect storm," that caused huge financial losses for legacy carriers across the globe. LCCs on the other hand, enjoyed a growing market share and consistent profits by limiting operating costs.

To cut costs and increase revenue, legacy carriers – both domestically and internationally - formed alliances and strategic partnerships. Alliances enable member airlines to share networks, worldwide hubs, gates, and reward programs. International alliances such as that formed by Northwest Airlines and KLM often benefit from antitrust immunity that allows them to share revenue pools and determine optimum ticket pricing.

Since 1970, the air cargo market has doubled in volume every ten years and is expected to continue growing at an average annual rate of 6.5 percent over the next two decades. Boeing forecasts that 60 million tons of cargo will be transported by air in the year 2017, tripling 1977 volumes.ⁱⁱ It is important to note that air cargo accounts for less than five percent of the value of goods transported within the U.S.

The three top costs across the sector are labor, fuel, and aircraft. The carriers are also greatly affected by labor unions, age of the aircraft, and the number of types of aircraft. Currently, the price of fuel has seriously increased the variable cost and adversely affects profits.

Pipeline: The pipeline sector is healthy; industry analysts anticipate continued expansion as the U.S. demand for petroleum products increases. In contrast with other means of moving bulk petroleum, natural gas, and chemicals, pipelines offer a safe and cheap method of transportation with minimal impact on the environment.

MACROECONOMIC FRAMEWORK

Market Structure: Each transportation mode operates on a unique portion of the competitive spectrum. At one extreme, just four major freight railroads dominate the mode in a classic oligopoly. Unlike other modes, rail companies own the infrastructure, land, and capital equipment required for operations. At the other extreme, a highly fragmented trucking sector approaches pure competition, despite a limited number of mergers that seek economies of scale. Somewhere between the two extremes sits the airline industry, in which established legacy carriers seek government support while LCC startups freely enter the largely deregulated air transport market. Finally, U.S. shipping firms resemble quasi-government entities, as numerous protectionist measures and public subsidies attempt to prop up a sector that is losing to foreign competition.

Barriers to market entry and exit vary widely; an individual who can obtain a commercial driver's license and finance a motor carrier can readily enter the trucking market. On the other hand, the difficulty of obtaining land for starting up a new pipeline or railway impedes market entry, as does the high capital cost of complex vehicles such as locomotives, container ships, or passenger aircraft.

Containerization of goods has altered the competitive transportation landscape. Intermodal transport—which moves goods by multiple modes—reduces handling costs but creates unique competitive relationships. Railroads traditionally compete against truckers for long-haul freight movement, but intermodal growth makes truckers a prime *customer* of railroads. Customers weigh variables such as cost, delivery time, and service in choosing which mode meets their needs. Likewise, security procedures for passenger traffic create nontraditional choices; airline delays along the east coast—often related to security procedures—turned many customers toward high-speed intercity rail transport.

Capacity Constraints: Accommodating growing transportation demands involves not simply constructing more vessels and vehicles, but expanding—or making more efficient use of—the infrastructure on which they operate. Each mode faces unique constraints, yet most deal with common issues such as environmental policy, land usage, and investment requirements. Air and sea traffic bottlenecks occur at ports, due either to passenger/load handling limitations or due to aircraft/ship competition for limited offload locations. Trucks, on the other hand, compete with private automobiles on congested roads in major cities. All of these modes rely on public funding for infrastructure investment, which at the federal level succumbs to political influence and competition for huge appropriations.

U.S.-International Comparison: The fixed U.S. infrastructure for railroads, highways and pipelines means that only air and shipping transportation modes truly compete internationally. Despite their financial losses and because of fierce domestic competition, U.S. airlines operate extremely efficiently compared to foreign airlines. As previously discussed, however, foreign shipping enjoys a growing competitive edge over U.S. shipping. In trucking, U.S. and European firms face similar challenges, although high European gas prices make trucking a costly alternative to modes such as inland barges. Additionally, European truckers must deal with rules unique to each country and

operate on disparate road networks. Lastly, a privately-owned, freight-centric U.S. rail system contrasts with passenger-oriented and partly government-owned European rail.

CHALLENGES

Organized Labor: The impact of organized labor on the transportation industry varies widely among each of the major modes. Labor normally represents the highest operating cost in each sector and often becomes the top target for cost reduction. Organized labor continues to change as the industry itself changes, and affects how firms operate and the flexibility they have to transform, modernize, and remain competitive.

Organized labor no longer plays a prominent role in the pipeline or trucking sector with less than 6 percent of motor carriers represented by the International Brotherhood of Teamsters. This is in contrast to the railroad industry where almost 75 percent of railroad transportation workers are members of unions, garnering relatively high wages.

The shipping sector is also highly unionized. Wage scales for U.S. merchant mariners, some of the highest paid seaman in the world, contribute significantly to our fleet's elevated operating costs. Most shipping companies must look to take advantage of emerging technologies to reduce manning levels in order to compete on a global scale or with other modes of transportation domestically.

Airline labor represents a significant cost variable in a sector that has endured over 200 company failures since deregulation in 1978. Compensation for pilots – often due to lucrative contracts awarded in the airline boom of the mid 1990s – fail to adjust to rapidly changing market conditions. Today, the airline financial crisis is driving a fundamental reform in the industry's labor cost structure and overall business model.

Technology: Across all modes of transportation, technological innovations lower the cost of operations and maintenance. All modes have inserted technology to expand productivity by automating routine tasks. For the shipping industry, the ability to automate port facilities to move containers from ships using robotic flatbeds and cranes guided by centrally controlled information technology systems can significantly reduce port operation costs. In trucking, global positioning systems track the location of shipments in the supply chain. Electronic ticketing and check-in improves the flow of passengers through airport terminals.

Transportation firms spend enormous amounts of money on security devices and productivity innovations to enhance port and terminal security, assist government agencies (Port Authorities, Coast Guard, Customs, etc.), provide assurance of trusted companies to keep the flow moving, and provide security for goods. To improve airport security, the industry seeks new ways of detecting threats without further slowing down the flow of passengers. Technologies such as biometrics identification and facial scan recognition offer opportunities to balance security and throughput concerns for several transportation modes.

Infrastructure: The United States has the most complex and diverse infrastructure in the world, playing a major role in our ability to transport people and goods. Accompanying this large infrastructure and increasing transportation demands are capital

investments required to maintain and expand the network. Additional capacity requires a multi-pronged approach to improve the efficiency of our existing infrastructure. Technological investment, infrastructure improvement of existing inland waterways, mass transit, and higher load capacity require programmed funding best accomplished through public and private partnerships.

Security: The transportation industry has long been a target of terrorist attacks and the weapon of choice for terrorists. The attacks of September 11, 2001, the Madrid train bombing, the attack on the French oil tanker near Aden, and worldwide truck bombings, serve to heighten the vulnerability of this industry. Each of the five modes of transportation tightened security, yet the size and scope of the system make it economically and physically infeasible to secure our 171,000 miles of rail track, 20 million containers, or 1.5 million miles of pipeline.

The Department of Homeland Security (DHS) has three initiatives underway to decrease the terrorist vulnerability of this industry. By “Pushing Out the Borders” through programs such as the Container Security Initiative (CSI), International Ship and Port Facility Security (ISPS), and Customs-Trade Partnerships Against Terrorism (C-TPAT), the U.S. Government cooperates with international partners to share costs and improve the security of global trade.

The trucking sector is researching methods to increase security on cross border shipments while at the same time minimize delays on goods entering the country. Government programs focus on both cargo security, by requiring advance notification of manifests, and personnel security through programs that confirm driver credentials. In exchange, cooperating companies receive expedited border crossing procedures.

Fuel: Rising fuel prices challenge the financial stability, economic growth, and survival of the transportation industry. As the second largest portion of operating expenses, rising fuel costs impact the profitability of transportation firms and increase the final price of consumer goods.

Increasing fuel prices are affected by many factors such as OPEC, world politics, the global economy, increased demand from Asia, and production in new regions such as West Africa and Russia. As energy prices soar, the nation’s transportation companies are scrambling to manage and adjust prices in order to keep up with higher costs. Many of the larger companies use hedging as their primary means to manage volatile prices. The airline industry’s leading trade association, the Air Transport Association, estimates that a one-cent rise per gallon of jet fuel costs the airlines \$180 million annually.

According to the American Trucking Association, the trucking industry has similar challenges and data to report. Fuel accounts for ten to twenty percent of trucking companies’ operating cost. Every one-cent increase in the price of fuel results in an annualized cost of \$300 million dollars for the trucking industry. Rising fuel cost are having major impacts on the world’s shipping companies as well, with the larger shipping vessels consuming in excess of 250 tons of fuel daily. The ability of transportation companies to pass fuel costs to consumers—either through fuel surcharges for shipping or through higher prices for final goods—impacts the profit margins of all firms in the industry.

OUTLOOK

The U.S. transportation system will remain a critical element of national power, both to the contribution to the nation's economic strength through the efficient distribution of goods, and for its ability to deploy and sustain military forces. While the U.S. transportation system functions well today, the industry must address capacity growth, infrastructure development and labor issues especially in the face of projected increases in freight volume.

For the next 15 years, the air and sea sections of the transportation industry are expected to grow 4.5 percent annually, in line with the forecasted growth of the U.S. GDP. On the other hand, both truck and pipelines are expected to grow only 2 percent annually and the rail is expected to grow only at the rate of 1 percent annually.

Demand for air travel is slowly picking up along with better economic conditions and a more stable geopolitical climate. However, the legacy carriers must overcome challenges such as the increased competition from the LCCs and the union labor negotiations. Passenger airlines are expected to make a net profit margin of 3.5 percent starting in 2004 in contrast to negative returns over the last three years.ⁱⁱⁱ Nevertheless, the sector will likely undergo further consolidations as a result of bankruptcies, mergers, acquisitions, and new alliances. Additionally, the LCCs' market share is expected to increase from 28 percent in 2003 to 40 percent by 2006.

Two major areas of concern for the shipping industry are limited major port capacities and the decline in the number of U.S.-flagged ships. The capacity issue will have to be addressed through either significant infrastructure investment or increased exploitation of our inland waterway system. The decline in U.S.-flagged vessels, although not an immediate threat to our economy, does affect our strategic lift capability. The continued weakening of our fleet causes a proportionate decline in qualified mariners able to man our Ready Reserve Force, and increases our dependence on foreign-flagged ships to carry U.S. military equipment during national emergencies. In today's uncertain world, this reliance on foreign assets to accomplish U.S. military objectives can be a very risky proposition.

Although the trucking industry is relatively healthy at present and a stronger domestic economy will continue to boost trucking freight volumes, the net profit margin is expected to stay low at 2.6 percent.^{iv} The emerging trend of collaboration and partnerships in the trucking industry in response to customer demands for better in-transit visibility, tighter inventories, complete supply chain services and the industry's ability to better manage the flow of material with continued expansion of geographic coverage will subsequently lead to increased market share in the future. However, the cost of highway congestion, new diesel engine emissions regulations, rising fuel costs, and a growing shortage of drivers will add to the shift from truck to rail transport.^v

The fastest growth business of the railroads is the intermodal service. This service will continue to grow rapidly in line with increases in imported cargo, because the price/service package is increasingly attractive to customers. Additionally, with cost cutting, the net profit margins across the board in the rail industry are expected to be up 3 percentage points to 12.3 percent over the next few years.^{vi}

GOVERNMENT GOALS AND ROLE

Due to the complex nature of the U.S. Transportation Industry, numerous federal, state and local governmental agencies regulate many aspects of the industry. Passenger and public safety and security are of particular concern. However, in addition to those concerns governmental involvement also addresses fair and honest business practices, open access to markets (domestically and globally), infrastructure capacities, research and development of technology. The U.S. Department of Transportation (DOT) leads federal government efforts. Its role is not just regulatory, the DOT also serves to facilitate, encourage and guide public/private ventures, R&D, and implementation of technology.

To mitigate national security risk, a wide range of U.S. government programs support the commercial transportation industry. Programs such as the Civil Reserve Air Fleet (CRAF) and the Voluntary Intermodal Sealift Agreement (VISA) receive guaranteed government business in exchange for a commitment to support DOD requirements during contingency operations. Similarly, the Maritime Security Program (MSP) provides direct government subsidies to ensure a strong and viable maritime transportation system.

Local, state, and federal governments are responsible for large parts of the transportation infrastructure. Lawmakers face two general approaches to addressing capacity constraints: 1) expand infrastructure, or 2) optimize existing infrastructure through technology insertion. Congressional appropriations tend to focus on infrastructure expansion, particularly for highways and airports. Reprioritization of funding to optimize existing infrastructure enables systemic efficiencies that reduce the need to construct additional infrastructure. For example, the use of global positioning system tools to compress aircraft separation by half effectively “doubles” the efficiency of the existing network. This long-term approach to transportation growth requires direct government involvement when industry proves unwilling or unable to invest in long-term technological programs.

Safety and security are the largest areas of government involvement and regulation of the transportation industry. While safety has traditionally been the focus of this government involvement, security has taken center stage due to worldwide terrorist actions. Terrorist use of transportation equipment as the vehicle for or as a weapon itself is reflected in recent government actions. The Free and Secure Trade (FAST) program and Container Security Initiative (CSI), are examples of the massive effort underway to ensure the security and viability of the transportation industry.

Cargo containers can be used to smuggle WMD, drugs, illegal immigrants and contraband into the U.S. Regarding transportation concerns, the overarching homeland security program seeks to “push out the borders” by ascertaining the security status of inbound cargo and passengers before they arrive on U.S. soil. This effort coordinates actions of U.S. Customs, U.S. Coast Guard, U.S. Citizenship and Immigration Services, and host nation personnel to screen and inspect container contents prior to their departure from foreign ports. Implementation programs include the use of smart seals on all containers entering the U.S. and X-ray machines at U.S. and international ports to inspect container contents as they arrive

The Presidential Commission on Critical infrastructure protection identified the U.S. transportation system as one of the eight critical infrastructures within our country. The

protection of bridges, tunnels, piers, channels, road networks, and heavy-duty cranes are critical to the functioning of the transportation network and the economic viability of the United States.

ESSAYS ON MAJOR ISSUES

The following three essays provide further insight and analysis into important issues in the transportation industry.

1. Globalizing Aviation: Keep Some Strings Attached
2. High-Speed Sealift for Short Sea Shipping and Strategic Mobility
3. Tanker-Civil Reserve Air Fleet

STUDY 1 GLOBALIZING AVIATION: KEEP SOME STRINGS ATTACHED

International aviation sits grounded by treaties that are influenced by protectionism, open-market competition, and national security. The European Court of Justice (ECJ) recently declared illegal several bilateral aviation treaties between European Union (EU) members and the US. During a period of economic turmoil for major US and European airlines and a war in Iraq that strained the limits of strategic US airlift, the Court's ruling has plunged the parties into negotiations for liberalizing transatlantic aviation.

BACKGROUND

Following a November 1944 civil aviation conference, most states regulated their airlines, the symbols of national pride and postwar growth. Private US airlines competed under regulations governing routes, pricing, and schedules. The landmark Airline Deregulation Act of 1978 benefited consumers as fares dropped by one-third from 1977-1992. For airlines, competition led to several high-profile failures; Pan Am's 1991 bankruptcy partly reflected the loss of protection on international flights.^{vii}

In the 1990s, the US liberalized international aviation by concluding 62 "Open Skies Agreements" [59 of which are bilateral arrangements and 11 of which include EU states] that lifted restrictions on carriers and prices.^{viii} Deregulation *within* Europe soon followed, and the European Commission (EC) challenged the wisdom of the treaties. In November 2002, the ECJ ruled that bilateral treaties violated the "establishment clause" of the Treaty of Rome, which prohibits restrictions on member states from establishing a business in another member state.^{ix} Because most bilaterals provide rights for airlines "substantially owned and effectively controlled" by nationals of the treaty signatories, they deprive airlines from other EU states of their rights. Furthermore, the EC asserted negotiating rights on behalf of member states for a comprehensive US-EU agreement.^x

Along with deregulation, President Ronald Reagan in June 1987 pledged to protect national security interests inherent in commercial aviation. A National Airlift Policy "shall be designed to strengthen the nation's airlift capability and where appropriate promote the global position of the United States aviation industry."^{xi}

KEY ISSUES

Establishment (Nationality) Clause. The establishment clause served as a legal basis for the Court ruling against member states. The US requirement that inbound flights be "owned and controlled" by nationals of the originating country prohibits, for example, Lufthansa flights from London to New York. Significantly, the US offered in the third round of negotiations the elimination of the nationality clause.^{xii}

Foreign Ownership of US Airlines. US law limits foreign shareholders of US airlines to 25 percent of voting stock, while Europe limits non-EU ownership of its airlines to 49 percent. Europeans expect the US to match their threshold of 49 percent. During the third round of negotiations, the US proposed exactly this level—however, previous attempts to raise the limit encountered stiff Congressional resistance.^{xiii}

Cabotage. Europeans view cabotage—the right to fly routes within another country—as the holy grail of any aviation treaty with the US. Cabotage prevents European airlines from flying to US cities beyond their original US destinations. Because of Europe's geography, the equivalent right for US airlines would be the "fifth

freedom” that allows a US airline to fly beyond its original European destination to another European nation. To date, US negotiators have not proposed lifting cabotage.^{xiv}

Fly America. The 1974 “Fly America Act”—a response to unfair competitive practices in international aviation—requires foreign air travel funded with federal dollars to be performed on US carriers.^{xv} Europeans consider the repeal of Fly America a “key” objective, but US negotiators have not incorporated the issue into formal discussions.^{xvi}

Access. Britain’s Heathrow Airport in London restricts US access to two carriers, United and American, as stipulated by amendments to the US-UK bilateral aviation treaty of 1977 (Bermuda II). Despite close US-UK diplomatic ties, negotiators have been unable to secure an Open Skies Agreement.^{xvii} Additionally, US air cargo carriers want access to European routes and eased restrictions on night landings. FedEx has entered the European market, but cannot service freight between its hubs in London and Paris.^{xviii}

SECONDARY ISSUES

Alliances avoid legal restrictions on mergers; code-sharing enables connecting service beyond foreign gateways, and Open Skies Agreements often grant antitrust immunity from price collusion. US willingness to eliminate nationality clauses paves the way for multinational airlines.^{xix} Additionally, the US prohibits domestic carriers from “wet-leasing” an aircraft (i.e., with crew) from foreign carriers, using the US carrier’s colors. Wet leasing masks the carriers’ nationality and ostensibly violates cabotage if a US-leased (but foreign owned and operated) aircraft flies domestic routes. Finally, Europeans seek participation in the CRAF, whereby carriers gain access to the government market in exchange for commitments to support military operations in crisis. Essentially a challenge to “Fly America”, European participation in CRAF threatens cabotage through potential links between domestic and overseas legs.

ECONOMIC CONSIDERATIONS

Competition has yielded numerous legacy airline failures, while profitable LCCs such as Southwest, Ryanair (Ireland) and easyJet (UK) capture 25 percent of US and European markets.^{xx} Legacy airlines decry the events of 1999-2003 that contributed to losses—recession, 9/11 attacks, SARS virus, and the Iraq war—but their cost structures (particularly lucrative labor contracts awarded in the mid-1990s) hinder profitability. Both sides fear competition; Europeans worry that open markets will hurt their carriers, partly because of U.S. efficiency and higher European labor costs.^{xxi} On the other hand, US carriers enjoy the protectionism in current bilateral agreements; the powerful Air Line Pilot Association opposes changes to cabotage or wet-leasing rules.^{xxii}

NATIONAL SECURITY CONSIDERATIONS

Underpinning the National Airlift Policy is the recognition that unlike the EU, the US is a global military power with global power projection requirements. The degree of US reliance on CRAF for both cargo and passenger airlift depends on the capacity of organic military airlift. US Transportation Command’s “Mobility Requirements Survey 2005” shows that if C-17 purchases increase from currently-funded numbers (150) to a best case (240), CRAF requirements drop by half; a new study will be published in 2005.^{xxiii}

Finally, the macroeconomic impact of this industry on the overall economy affects national security. US airlines employ 600,000 people, generate \$100 billion annual

revenue, and sustain 10 million jobs.^{xxiv} The cascading effect of downturns in aviation requires government “promotion” to sustain the industrial base for national security.

DIPLOMATIC AND POLITICAL CONSIDERATIONS

Unlike most diplomatic discussions, US-EU aviation negotiations include industry and labor representatives. US proposals require legislative action that may stifle agreement in an election year marked by labor concerns. Following the post-9/11 bailouts, congressmen chastised the airlines for “existing on life-support” by failing to make a profit.^{xxv} EU anti-subsidy enforcement contributed to the collapse of Belgium’s Sabena airline, and the EU has threatened to penalize foreign airlines that benefit from subsidies or engage in “unfair” pricing.^{xxvi} Nevertheless, internal EU dissent has dimmed such open-market sentiment. Because EU offers would permit US competition for Heathrow, the UK has floated options to be excluded from agreements that open access.^{xxvii}

RECOMMENDATIONS

Compromise on Foreign Ownership. Congress twice rejected administration attempts to increase the limit of foreign ownership in US airlines from 25 percent to 49 percent. Raising the limit to 40 percent displays good-faith bargaining while enabling capital infusion for US airlines. Foreign ownership approaching 49 percent risks challenges to the “national” status of CRAF carriers. In conflicts where foreign investors may not support US policies, legal delays could jeopardize the time-sensitive need for airlift.

Loosen Fly America Act. To the extent that unfair international air competition has disappeared since this 1974 law, US government travelers should be required to consider fares and airlines as variables when purchasing international tickets. The Act—essentially a subsidy—unnecessarily burdens taxpayers while minimizing US airline efficiency on overseas routes. Relaxation should be restricted to those countries with which we have Open Skies Agreements and determine to operate without government subsidies.

Maintain US-Only CRAF. Unlike Fly America, peacetime CRAF incentives link directly to expanded strategic airlift needs during crisis. European CRAF participants would not be subject to US executive order and might challenge the legality of such treaties in times of US mobilization. Significant planning and financial commitments that balance organic airlift with CRAF depend on reliable, US-flagged carriers.

Permit Limited Cabotage. Assuming US-EU agreement on Open Skies, limited cabotage leverages US airline competitive advantages. US air cargo cabotage in Europe may require *quid pro quos* for European firms, and US cargo firms welcome liberalization. Passenger cabotage requires concessions on Heathrow, perhaps through a US offer of “consecutive cabotage;” in effect, the UK trades London for minor US hubs.

CONCLUSION

EU efforts to reduce US “protectionism” must account for the national security requirements of a global power. In this competitive industry where legacy carriers augment strategic military airlift, US negotiators with the EU must consider the effects of airline restructuring—LCCs and alliances—on US economic and military health.

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STUDY 2 HIGH-SPEED SEALIFT FOR SHORT SEA SHIPPING AND STRATEGIC MOBILITY

INTRODUCTION

Ocean going vessels have steadily grown in size in order to reap the benefits of economies of scale and to handle the increased requirements brought about by globalization and a growing world population. This trend will inevitably give rise to two distinct challenges for our nation. The first is that our current infrastructure cannot sustain this continued growth. Port capacities, channel depths, and cargo handling capabilities are finite and are not easily modified to facilitate larger carriers. Enlarging ports and dredging waterways to satisfy the substantial requirements of the Supertankers and Post-Panamax container ships would necessitate significant capital investment, disrupt current services, and meet intense environmental scrutiny. Secondly, the significant increase in volume of trade, which is expected to at least double by the year 2020, will bottleneck our existing port facilities and exacerbate the current highway congestion problems surrounding our major ports.

Highway congestion is one of the biggest problems facing our economy today and is one of the top issues faced by the Department of Transportation (DOT). In their 2003-2008 strategic plan DOT calls for exploring ways to develop a robust, domestic short sea and waterway shipping system to alleviate congestion, stating that “our Nation’s coastal and waterway shipping system is underutilized and could provide a practical, safe and efficient means of transporting freight.”^{xxviii}

To achieve this objective and offset the imminent threat to our economic well being we must aggressively pursue alternatives in the maritime industry that are economically, and environmentally feasible. We must develop revolutionary new methods that will improve productivity and increase port efficiency while relieving the anticipated gridlock on our highways. Capitalizing on advancements in cargo handling technologies and/or processes and developing efficient high-speed ships to promote inland and coastal shipping can help us to achieve those goals.

DISCUSSION

The past decade has seen a dramatic decline in inland waterway use due in large part to the speed and convenience of shipping by truck and rail. The U.S. Maritime Administration (MARAD) has begun to address this issue through the promotion of a Short Sea Shipping (SSS) initiative. Similar to the airline and trucking industries approach to “hub and spoke” delivery, short sea shipping involves operations where a large vessel delivers and picks up its containers at one major port and then transports them on smaller feeder vessels to ports along the coast or inland. This practice enables carriers to take advantage of the “economies of scale” that both the large mother ship and the smaller less costly feeder ships have to offer.

Exploring a variety of methods to develop this new waterborne transportation system, MARAD intends to involve maritime business and community representatives to advance the project. Their belief is that SSS will support economic growth and trade, create jobs, reduce congestion and pollution, enhance national security, and create new tax bases. A study conducted assessing the commercial viability of a New York-to-Boston service validated their beliefs and a NY/NJ Port Authority project, the Port Inland Distribution

Network (PIDN), has already begun to reap benefits. The PIDN eliminates millions of vehicle miles by utilizing the Hudson River to transfer shipments from New York City to Albany. The challenge to taking full advantage of this initiative, however, lies in the shipping industry's ability to make SSS an attractive option for commercial shippers. Speed, reliability, and affordability are the keys.

The competition to transport goods quickly and economically between the various modes of transportation continuously forces shipping companies to innovate to attract business. In the past, this innovation has led to cargo specialization, larger ships, and propulsion plants that are more efficient and offer greater speed. They replaced sails and steam with diesel and gas turbine powered ships. Ship types, such as Ro/Ro, Lo/Lo, and LASH ships are replacing the general cargo ships. The industry continues to develop to suit the market, but the market continues to change to suit our fast-paced and just-in-time lifestyle. Industry must again innovate if they are to regain market share and the federal government must become involved in accelerating the process if we are to negate the disastrous economic impact of insufficient port capacity and throughput.

Internationally, current modes of transportation offer customers either high speed/high cost service (air) or low speed/low cost service (ships). Normally the high value, low weight items travel by air, while medium to low value and heavier items travel by sea. No mode currently provides for the middle of the road solution, medium speed/medium cost. High-speed shipping initiatives may be able to fill that void and provide the maritime industry with a new market advantage. The problem will be to make fast, low-drag hull forms and fuel-efficient propulsion systems cost effective enough for a business model to work. A 2003 RAND study pointed out, today's "fast ships are not generally considered to be commercially viable because of their very high operating costs."^{xxix} Although current research and development efforts have led to improved designs such as Hydrofoils, Surface Effect Ships (SES), Small Waterplane Area Twin Hull (SWATH), planing multi-hulls and mono-hulls, they are of limited size for large-scale commercial practicality. None are capable of carrying large volumes of cargo while keeping fuel expenses in check.

The Center for the Commercial Deployment of Transportation Technologies (CCDoTT)^{xxx} is pursuing several options, in conjunction with industry and academia, to support both commercial express transport and U.S. government sealift requirements. Their efforts include teaming with KMM^{xxxi}, a naval architects consulting firm investigating the feasibility of very high-speed trimaran technology and a partnership with FastShip, Inc, to validate a multifaceted approach to high-speed cargo delivery. These later efforts appear to have the most promise for short sea and military sealift applications in the near future.

FastShip, Inc. has designed an international time-definite express freight service that integrates high-speed vessels with dedicated terminals and patented loading systems to facilitate rapid delivery and handling of cargo. Expectations are that planned "initial networks linking North America and Europe will provide door-to-door service times comparable to standard airfreight at half the cost."^{xxxii} Preliminary design estimates predict the 870 ft FastShip will be capable of 45 kts with a payload of 8070 long tons or 1360 TEU's. Although impressive, this limited capacity, compared to modern 8,000 TEU container ships, would suggest that these ships would initially be better suited to act

as feeder ships operating on coastal and inland waterways in the Short Sea Shipping arena vice transoceanic.

STRATEGIC MOBILITY

Notwithstanding their commercial application, high-speed vessels could also provide significant military value, multiplying the deterrent effect of U.S. based assets with their ability to quickly deploy and support forces abroad.^{xxxiii} The Department of Defense (DoD), one of the world's largest transportation providers and customers, maintains its own fleet of organic assets but must also rely, sometimes heavily, on commercial resources to effectively carry out its mission. Because of cost and lift capability, about 95 percent of DoD's peacetime and wartime cargo moves by sea. This reliance on relatively slow ships hugely influences our timeline for entering into large-scale conflict. As the pace of world events speeds up, we must generate the capability to get our troops and their gear to the fight in sufficient time to affect the outcome. Joint Vision 2020 states, "If our Armed Forces are to be faster, more lethal, and more precise in 2020 than they are today, we must continue to invest in and develop new military capabilities."^{xxxiv} High-speed vessels operating as feeder ships from established Sea Bases can play a major role in "Dominant Maneuver" and "Focused Logistics." Reinforcing this premise, JV 2020 goes on to say, "The increased speed, capacity, and efficiency of advanced transportation systems will further improve deployment, distribution, and sustainment."

Although not developed enough for large-scale transoceanic movements, smaller high-speed vessels have already been used militarily with great success. The operational use of the HSV X-1 "Joint Venture" by the U.S. Navy and Marines during Operation Iraqi Freedom is a prime example. The experimental tri-hull can carry more than 700 tons of cargo at speeds averaging 35 kts and has a shallow enough draft to get into ports restricted to similar sized cargo ships. In the opening hours of the war, "Joint Venture sped into the shallow Persian Gulf waters near the southern Iraqi port of Umm Qasr, acting as an afloat forward staging base for Marine Fleet Anti-Terrorism Security Teams and Navy SEAL commandos."^{xxxv} Later, she successfully conducted an operational lift for Marines, shipping dozens of trucks and containers from Kuwait to Bahrain in 8 hours, a trip that would have taken days by truck.

Another experimental effort with great promise is the Military Sealift Command (MSC) and Marine Corps' Third Marine Expeditionary Force (III MEF) use of the twin-hull ship WestPac Express. Chartered for 3 years, the WestPac Express can carry an entire reinforced battalion of Marines, people and equipment, at a sustained speed of 33 kts. She will be used to transport III MEF in the Japanese and Pacific region, and with just a 14 foot draft, she is capable of operating in a wide variety of ports. The continued success of Joint Venture and WestPac Express will ultimately validate the requirement for high-speed craft in intra-theater military operations.

CONCLUSION

High-speed shipping is a promising form of transportation that can be instrumental in reducing port and highway congestion while providing our military with a unique strategic capability. The key will be to develop the hull and engine technologies so that high-speed vessels can economically compete with trucks and rail. Although studies

have proven that high-speed shipping could be economically viable, once established, industry seems reluctant to jump into the mix without some form of financial guarantees.

Two important factors should convince the government to support this effort. The first is that port and highway congestion will continue to grow commensurate with the expected increase in international trade. Increasing the delivery speed of cargo could help to turn MARAD's Short Sea Shipping initiative into an attractive alternative for commercial shippers. Moving the increased trade efficiently out of our major distribution hubs along coastal routes and inland waterways will reduce port and highway congestion while providing an economic boost to many regions.

Secondly, the increased requirement to rapidly move troops and their gear to areas of conflict worldwide on short notice necessitates change. High-speed vessels can answer that call and would fully support the military's vision for the future. As reported in a recent RAND study, if the government expects to have these ships available for short-notice military deployments "the next generation of fast ships likely must be government owned and operated, or, if they are privately owned vessels, substantial government subsidies will be required"^{xxxvi} Promoting their commercial development and ensuring their availability through programs such as the Voluntary Intermodal Sealift Agreement (VISA) or the Maritime Security Program (MSP) could be the answer.

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STUDY 3 TANKER CIVIL RESERVE AIR FLEET

INTRODUCTION

The Air Force has begun to address recapitalization of its air refueling fleet. In light of future air refueling requirements and the aging legacy fleet, they are exploring business cases for purchasing new or used aircraft and for leasing aircraft. However, other alternatives are getting more attention and could offer a stop-gap alternative to an excessively hasty or costly decision to buy or lease new aircraft in the very near future. Those developing alternatives include contracting with commercial firms to provide air refueling capability, or creating a concept like the Civil Reserve Air Fleet, with tanker aircraft. This tanker version of the Civil Reserve Air Fleet (T-CRAF) program would appear to contain some attractive features for the government, such as, relatively inexpensive upfront costs and reduced overhead burdens. The contracted option also includes benefits that include relieving stress from the total force during periods between deployments or during periods of increased training activity in the CONUS.

There is currently a healthy commercial market for converting passenger aircraft to cargo carriers. In fact, over the next decade and a half, the industry expects to double the size of the cargo fleet to handle the increased demand for goods. This commercial activity along with increasing global commitments, downsized military force structures and increased pressure on aircrews provides a window of opportunity to initiate a T-CRAF program.

DISCUSSION

A traditionally modeled T-CRAF program must provide necessary (or adequate) financial incentives to the commercial industry to counter the risk of the loss of the market share when crews and aircraft are diverted during program activation. Commercial airlines that contribute assets to passenger and cargo CRAF can bid on a percentage of peacetime government business in direct proportion to their commitment to the program. For the passenger airline, the incentive takes the form of seats filled with government travelers. For the cargo airline, the incentive is the receipt of some of DOD's freight missions - a critical mission during activation.

A commercial air-refueling firm, like Advance Training Systems International, must operate to make money. ATSI is a privately-operated dissimilar air combat training firm in Arizona. They are comprised of former military operators and maintainers and have carved out a niche in the current market and are making money training Navy and Air Force fighter pilots. The government must be willing to pay slightly higher costs for a purely contracting air-refueling operation if that alternative is chosen as the best short-term option.

Equipment issues are at the center of the argument for and against a tanker derivative of the CRAF. Complete recapitalization to purchase new tanker aircraft is anticipated to cost 150 to 225 million dollars each, whereas converting some older aircraft to newer R model tankers would cost approximately 29 millions dollars per aircraft.^{xxxvii} However, that does not address the age of the fleet (more than 40 years old) and the declining available years of service life. The more palatable alternative is to modify existing, newer aircraft like the Boeing 767 or the Airbus 320. Current cost estimates are unavailable, however, the conversion is extensive. Further, the modifications add weight,

reduce fuel efficiency, increase operating costs, and decrease range and useful payload. All of those issues have tangible impacts on the contracting options and the business case cost-benefit analysis. The other very difficult issue associated with equipment is the various assumptions used to develop the cost estimates. Estimates relative to the age of the equipment and useful life of the equipment and service life of the aircraft are key to making accurate cost estimates. Age related estimates have been one of the most contentious issues surrounding the US Tanker lease program. The contracted air-refueling option eliminates some of the issues associated with equipment costs, but still faces issues associated with embedded overhead costs resulting from the type aircraft used and the operations and maintenance costs incurred.

In addition to the costs associated with the conversion and maintenance of the aircraft, all the components need to be maintained and operated. The responsibility for the maintenance and training required to maintain these items must be included in future cost-benefit analysis. Most current programs include contractor-supported maintenance. Both Airbus and Boeing are offering contract maintenance and training services, but that contributes to the overall life cycle costs and it complicates the mix of those qualified to operate the aircraft and equipment.

The principle difference between the two feasible alternatives described above is the source for the aircrews (pilots and boom operators) to fly and accomplish the missions. Flying a military tanker requires more skills than piloting commercial cargo or passenger aircraft. The T-CRAF alternative would draw more heavily on military crews whereas the contracted alternative would pull from the commercial companies' resources. Subsequently, the source for the crews also dictates their authorized operating environment ... those facts are at the heart of the manpower issues associated with commercial tanker operations. Under the contracting option, the contractor would provide the people with the right skills, to include the boom operators. The T-CRAF option could use National Guard and Air Force Reserve units as well as qualified military pilots in the commercial air carriers to augment active duty crews. Under this scenario, there must be a training mechanism in place to ensure the CRAF crew are trained and ready.

The recent outsourcing of advanced tactical training services offers an alternative scenario that could meet some of the air refueling needs. At a time when there aren't enough pilots and aircraft available to support domestic and allied training, a few entrepreneurial ex-fighter pilots are now providing dissimilar air combat training for Air Force and Navy pilots. This company took only a few years to become profitable and serves as an excellent case study for a similar tanker program/venture. A private firm could support air refueling training missions in CONUS, enabling the aging Air Force assets to focus on in-theater operations while the Air Force pursue a longer-term recapitalization strategy.

UNITED KINGDOM TANKER PROGRAM

The United Kingdom's newly awarded Future Strategic Tanker Aircraft (FSTA) contract can provide insight into how to structure a commercial air-refueling program. The FSTA will replace the air refueling capability currently provided by legacy aircraft (VC10 and TriStar). Rather than procuring new assets to meet their future requirements, the U.K. Ministry of Defence (MOD) decided to award a service contract to a

commercial firm. Two consortia formed to submit bids on the program. In January 2004, the MOD awarded the contract to Air Tanker, a consortium consisting of EADS, Rolls Royce, Cobham and Thales.

As currently planned, Air Tanker will procure 16 new A330-200s, provide fleet management, base and line maintenance, logistical support. The UK plan calls for the Royal Air Force (RAF) pilots to operate the consortium's aircraft during refueling missions. The consortium will provide training services to the reserve air and ground crews. The Royal Air Force will be responsible for military operations. The program should benefit from the efficiencies provided by commercial best practices, just in time spares supply, and the global Airbus support network.

The FSTA program will fund the consortium to modify the aircraft and pay them by the hour for refueling services. The Ministry of Defence has the flexibility to change the flying hours each year. When not executing air-refueling missions, the consortium can use the airplanes to generate revenue in commercial business ventures. According to its Internet site, Air Tanker selected the A330-200 because air-refueling modifications are easily applied and the growing commercial demand for the aircraft will ensure revenue. In addition, the A330-200 configured for air refueling can still provide full passenger and cargo capability.

The contract is for 27 years and is worth approximately 13bn British pounds (\$23.8B US). On the surface, this appears to be an expensive alternative to a tanker-leasing program. Since the UK Ministry of Defence is currently involved in detailed negotiations with Air Tanker, actual costs and other contract specifics are not available at this time.

CONCLUSION

Based on our research, it is difficult to build a fiscally sound business case to support the pursuit of a T-CRAF capability without more cost data for a cost-benefit analysis. However, the need still exists for new/additional air refueling capability in the US military. T-CRAF might offer a stopgap capability until a longer-term recapitalization plan is enacted. After researching this topic, three recommendations emerged:

- Thoroughly research cost factors driving UK MoD decision for FSTA
- Research military flying training business ventures (i.e. Advanced Training Systems International) that have been successful in understanding legal and economic considerations
- Study various mixes of T-CRAF and/or contracted air-refueling operations to create stop-gap capability

Finally, the civilianized function of air refueling is unique. In the cases of passenger transport and cargo transport, civilian firms accomplish those tasks daily and are well trained, staffed and equipped to perform those missions. That is the underlying concept behind the existing CRAF program. Unfortunately, neither commercial carriers nor any similar organization within the private transportation sector commonly performs the function of aerial refueling. Therefore, future steps toward a T-CRAF program should be pursued with care and significant consideration for unforeseen costs and capability limitations due to operating restrictions of civilian aircraft and operators in a combat/military environment.

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TRANSPORTATION INDUSTRY CONCLUSIONS

The U.S. transportation industry is generally healthy and remains the foundation of national prosperity and security. Transportation-related goods and services contributed \$1 billion to a \$10 trillion U.S. GDP in 2001. The resounding military success of Operations ENDURING FREEDOM and IRAQI FREEDOM following the events of 9/11 demonstrated the transportation industry's ability to mobilize effectively and meet wartime surge requirements. The industry is not without challenges, but proper government oversight and support will ensure the transportation industry's ability to support national security and economic health.

The study revealed the following six take-aways from the transportation industry:

- Transportation in the U.S. is a growth industry. Throughput in all modes is expected to increase through 2020 due to globalization and projected continued economic growth. Although the airline industry was hit hardest and is still recovering from the "perfect storm," air travel is approaching pre-9/11 levels to the point where capacity issues at selected nodes are resurfacing.
- Transportation is a leading indicator of overall economic strength. Downturns in transportation portend recessions and upturns in transportation tend to precede growth. Our discussions with industry lead us to conclude that the U.S. economic recovery is in full swing.
- All transportation modes represent likely terrorist targets or weapons of choice. The events of 9/11, the 2002 bombing of a French tanker off Aden, and the recent Madrid railway attack attest to this.
- Transportation infrastructure and equipment maintenance require large amounts of capital investment. European governments tended to place more emphasis on long-term development compared to the U.S. government, which relies heavily on private investment and joint public-private transportation projects.
- DOD relies heavily on the transportation industry, as power projection requires extensive use of private industry assets. On the other hand, DOD represents a relatively small customer of private transportation industry.
- Leadership plays a vital role in the success of firms in the transportation industry. Effective corporate leaders understand the fundamentals of cost, revenue, and people; strong strategic vision and leadership in the complex transportation industry drive the effective and productive companies that enable unmatched economic and military power.

NOTES

- ⁱ U.S. Department of Transportation, Bureau of Transportation Statistics Pocket Guide 2004. Note that this figure includes all transportation expenditures, including such items as automobiles, gasoline sales, etc.
- ⁱⁱ “The Tiaca Manifesto,” n.d., The International Air Cargo Association, <<http://www.tiaca.org/content/chapter1.asp>> (3 June 2004).
- ⁱⁱⁱ The Value Line Publishing “Air Transport Industry” overview, Page 257, March 12, 2004.
- ^{iv} The Value Line Publishing “Trucking Industry” overview, Page 266. March 12, 2004.
- ^v Lawrence H. Kaufman, “Has Intermodal Reached Critical Mass and Real Profitability?” TRAINS Magazine February 2004.
- ^{vi} The Value Line Publishing “Railroad Industry” overview, Page 284, March 12, 2004.
- ^{vii} Asif Siddiqi, U.S. Centennial Flight Commission, “Deregulation and its Consequences,” n.d., <http://www.1903to2003.gov/essay/Commercial_Aviation/Dereg/Tran8.htm> (12 March 2004).
- ^{viii} For the World Trade Organization vision for lowering trade barriers, see “The World Trade Organization,” n.d., <http://www.wto.org/english/res_e/doload_e/inbr_e.pdf> (12 March 2004). For a listing of Open Skies Agreements, see U.S. Department of State, “Open Skies Partners,” 14 January 2004, <<http://www.state.gov/e/eb/rls/othr/22281.htm>> (14 March 2004).
- ^{ix} Zuckert Scoutt & Rasenberger, L.L.P., “European Court Says “Bye Bye Bermuda,” *Aviation Advisor*, 6 November 2002, <<http://zsrlaw.com/publications/Newsletters/AAspercent20Novpercent206percent2002.htm>> (14 March 2004).
- ^x Cathy Buyck, “The EU’s Historic Judgement,” *Air Transport World* 40, no. 1 (January 2003): 36. Of particular prominence on the EU side is EU Vice President and Transport Commissioner, Ms Loyola de Palacio. Buyck notes that just one month following the European Court of Justice ruling, de Palacio backed up her public rhetoric about her authority to negotiate an EC-US agreement with a formal memorandum to the European Council and European Parliament requesting the mandate. By June 2003, the EU transport ministers granted the EC this mandate, setting the stage for the first round of talks in October 2003.
- ^{xi} Ronald Reagan, “National Security Decision Directive, National Airlift Policy,” 24 June 1987, <http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/tp/html/trans_programs/defense_trans_library/airpolicy/airpolicy.html> (17 March 2004).

^{xii} Angela Greiling Keane, "Progress in EU Aviation Talks?" *Journal of Commerce*, 1 March 2004, 1.

^{xiii} Demetri Sevastopulo, "US Offers to Ease Curbs on Ownership of Airlines," *Financial Times*, 21 February 2004. For Congressional dismissal of the proposed 49percent ownership limit, see Keane, 1. According to Keane, Secretary of Transportation Norman Mineta tried to slip the provision into a Federal Aviation Administration bill that was under consideration.

^{xiv} Michael Friedlein, telephone interview by author, Washington, DC, 19 March 2004. Colonel Friedlein is a military deputy for the Assistant Deputy Under Secretary of Defense (Transportation Policy), and represented his office at the US-EU negotiations.

^{xv} Mike Cannon, "Fly America—More Than Just a Name," Office of the Assistant General Counsel for Finance and Litigation, 13 February 2002, <<http://www.ogc.doc.gov/ogc/fl/fald/itl/itlv14.pdf>> (14 March 2004).

^{xvi} "BA's Eddington Urges EU to 'Keep Sights High' in Talks With US," AFX News Limited, 12 February 2004, <<http://web.lexis-nexis.com/universe/>> (22 March 2004). For the fact that Fly America has not been incorporated into formal discussions, see Friedlein interview, 19 March 2004.

^{xvii} James Tarrant, personal interview by author, Washington, DC, 23 March 2004. An example of the tenacious negotiations followed the bankruptcies of the US air carriers (Pan Am and TWA) that had Heathrow access under Bermuda II. In order to secure access for the US carriers that assumed the routes (American and United), the US companies had to handsomely compensate the British government as a condition of renegotiation. From 1991-1996, Mr Tarrant served as Deputy Assistant Secretary for Transportation Affairs and the senior aviation negotiator for Open Skies Agreements with the major European nations.

^{xviii} Angela Greiling Keane, "US-EU Talks Won't Ignore Air Cargo," *Journal of Commerce*, 20 October 2003, 34.

^{xix} "Air France and KLM Get Close," Economist.com, 2 October 2003, <<http://proquest.umi.com/pqdweb?index=1&did=000000417554201&SrchMode=1&sid=2&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1080481245&clientId=3921>> (17 March 2004).

^{xx} "Open Skies and Flights of Fancy," *The Economist*, 4 October 2003, <http://web.lexis-nexis.com/universe/document?_m=d2b8f0580656a87adb12f88eca321743&_docnum=26&wchp=dGLbVzz-zSkVA&_md5=fb3fb50cddce9caccf0a2ebee2163dbc> (22 March 2004).

^{xxi} “Open Skies,” *Business Europe*, 11 June 2003, 6. For a detailed European study comparing airline efficiency, see Paul Seabright and Charles Ng, “Competition, Privatisation and Productive Efficiency: Evidence From the Airline Industry,” *The Economic Journal* 111, no. 473 (July 2002): 591-619, as cited in Thomas A. Firey, “Nothing to Fear from Open Skies with European Union,” CATO Institute, 11 October 2003, <<http://www.cato.org/dailys/10-11-03.html>> (22 March 2004).

^{xxii} Russ Bailey and Seth Rosen, “Historic Aviation Talks,” *Air Line Pilot*, October 2003, 18, <<http://www.alpa.org/alpa/DesktopModules/ViewDocument.aspx?DocumentID=5390>> (14 March 2004).

^{xxiii} Sharon Weinberger, “Handy: Airlift Shortage Forcing Military Tradeoffs,” *Defense Daily*, 23 March 2004, 3.

^{xxiv} James C. May, “State of the Industry,” 25 March 2004, <<http://www.airlines.org/news/d.aspx?nid=7651>> (27 March 2004). Mr May is President and CEO of the Air Transport Association.

^{xxv} Demetri Sevastopulo, “Politician Hits Out at US Airlines,” *Financial Times*, 2 October 2003, 32. Sevastopulo cites Rep John Mica (Rep-FL), the Chairman of the House Aviation Subcommittee. Mica suggested that the best thing that could happen to the carriers would be bankruptcy, so they could increase leverage with labor unions who are opposed to large lay-offs.

^{xxvi} For the Sabena failure, see “Unified Transport Market Takes Shape,” *The Journal of Commerce Online*, 22 December 2003, 1. For EU threats to penalize foreign airlines, see “The Week,” *Journal of Commerce*, 23 February 2004, 1.

^{xxvii} Demetri Sevastopulo, “EU Dilemma on Transatlantic Aviation Market Deal,” *Financial Times*, 9 March 2004, 13.

^{xxviii} U.S. Department of Transportation Strategic Plan 2003-2008, *Safer, Simpler, Smarter Transportation Solutions*, Pg. 7-8, September 2003

^{xxix} John Gordon and David Orletsky, *Chap. 9, Moving Rapidly to the Fight*, The U.S. Army and the New National Security Strategy, RAND, 2003, pg 207-208

^{xxx} The CCDoTT is an organization whose charter is to solve problems in the transportation sector of the U.S. economy through private sector, educational institutions, and government cooperation.

^{xxxi} Additional information can be found on the KMM homepage at www.kmmc.net/innovation.html n.d. (3 June 2004).

^{xxxii} “About FastShip,” FastShip Inc, n.d.

<<http://www.fastshipatlantic.com/aboutfastship.html>> (3 June 2004).

^{xxxiii} LCDR Shawn Callahan, USN, *The Impact of Fastship and High Speed Sealift on Strategic Sealift*, Air Command and Staff College Research Report, Pg 2, April 1998

^{xxxiv} CJCS, Joint Vision 2020, US Government Printing Office, Washington, DC, June 2000

^{xxxv} Christian Lowe, *Combat tests Experimental Ship High-speed vessel proven during war in Iraq*, Marine Times, 20 June 2003

^{xxxvi} John Gordon and David Orletsky, *Chap. 9, Moving Rapidly to the Fight*, The U.S. Army and the New National Security Strategy, RAND, 2003, 208.

^{xxxvii} Carlo Kopp, “Expanding the Tanker Fleet: Part 2 Aircraft Types for Fleet Expansion.” May 2001. Available at <http://www.f-111.net/CarloKopp/aar-expand-2.html> F-111net website

SELECTED BIBLIOGRAPHY

- “Air France and KLM Get Close.” *Economist.com*, 2 October 2003, <<http://proquest.umi.com/pqdweb?index=1&did=000000417554201&SrchMode=1&sid=2&Fmt=3&Vinst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1080481245&clientId=3921>> (17 March 2004).
- “Air Transport Industry.” *The Value Line Publishing*, 12 March 2004.
- “BA’s Eddington Urges EU to ‘Keep Sights High’ in Talks With US.” AFX News Limited, 12 February 2004, <<http://web.lexis-nexis.com/universe/>> (22 March 2004).
- Bailey, Russ and Seth Rosen. “Historic Aviation Talks.” *Air Line Pilot*, October 2003, 18, <<http://www.alpa.org/alpa/DesktopModules/ViewDocument.aspx?DocumentID=5390>>(14 March 2004).
- Buyck, Cathy. “The EU’s Historic Judgement.” *Air Transport World* 40, no. 1, January 2003.
- Callahan, LCDR Shawn, USN. “The Impact of Fastship and High Speed Sealift on Strategic Sealift.” Research Report, Air Command and Staff College, April 1998.
- Cannon, Mike. “Fly America—More Than Just a Name.” Office of the Assistant General Counsel for Finance and Litigation, 13 February 2002, <<http://www.ogc.doc.gov/ogc/fl/fald/itl/itlv14.pdf>> (14 March 2004).
- Firey, Thomas A. “Nothing to Fear from Open Skies with European Union.” CATO Institute, 11 October 2003, <<http://www.cato.org/dailys/10-11-03.html>> (22 March 2004).
- Friedlein, Michael. Telephone interview by author. Washington, DC, 19 March 2004.
- Gordon, John, and David Orletsky. “The U.S. Army and the New National Security Strategy”. *RAND*, 2003.
- <<http://www.fastshipatlantic.com/aboutfastship.html>>
- <<http://www.kmmc.net/innovation.html>>
- Kaufman, Lawrence H. “Has Intermodal Reached Critical Mass and Real Profitability?” *TRAINS Magazine* February 2004.
- Keane, Angela Greiling. “Progress in EU Aviation Talks?” *Journal of Commerce*, 1 March 2004.

Keane, Angela Greiling. "US-EU Talks Won't Ignore Air Cargo." *Journal of Commerce*, 20 October 2003.

Lowe, Christian. "Combat tests Experimental Ship High-speed vessel proven during war in Iraq." *Marine Times*, 20 June 2003.

May, James C. "State of the Industry," 25 March 2004,
<<http://www.airlines.org/news/d.aspx?nid=7651>> (27 March 2004).

"Open Skies." *Business Europe*, 11 June 2003.

"Open Skies and Flights of Fancy." *The Economist*, 4 October 2003, <http://web.lexis-nexis.com/universe/document?_m=d2b8f0580656a87adb12f88eca321743&_docnum=26&wchp=dGLbVzz-zSkVA&_md5=fb3fb50cddce9caccf0a2ebec2163dbc> (22 March 2004).

"Open Skies Partners," 14 January 2004. <<http://www.state.gov/e/eb/rls/othr/22281.htm>> (14 March 2004).

Rabinow, Richard A. "A report prepared for the Association of Oil Pipe Lines." April 2004. <<http://www.aopl.org>>. (15 May 2004).

"Railroad Industry." *The Value Line Publishing*, 12 March 2004.

Reagan, Ronald. "National Security Decision Directive, National Airlift Policy." 24 June 1987. <http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/tp/html/trans_programs/defense_trans_library/airpolicy/airpolicy.html> (17 March 2004).

Seabright, Paul and Charles Ng. "Competition, Privatisation and Productive Efficiency: Evidence From the Airline Industry." *The Economic Journal* 111, no. 473 (July 2002).

Sevastopulo, Demetri. "EU Dilemma on Transatlantic Aviation Market Deal." *Financial Times*, 9 March 2004.

Sevastopulo, Demetri. "Politician Hits Out at US Airlines." *Financial Times*, 2 October 2003.

Sevastopulo, Demetri. "US Offers to Ease Curbs on Ownership of Airlines." *Financial Times*, 21 February 2004.

Siddiqi, Asif. "Deregulation and its Consequences." U.S. Centennial Flight Commission. n.d. <http://www.1903to2003.gov/essay/Commercial_Aviation/Dereg/Tran8.htm> (12 March 2004).

Street, Mary. Telephone interview by author. Washington, DC, 19 March 2004.

Tarrant, James. Personal interview by author. Washington, DC, 23 March 2004.

“The Tiaca Manifesto.” n.d. The International Air Cargo Association.
<<http://www.tiaca.org/content/chapter1.asp>> (3 June 2004).

“The Week.” *Journal of Commerce*, 23 February 2004.

“The World Trade Organization.” n.d. <http://www.wto.org/english/rese/doload_e/inbre.pdf> (12 March 2004).

“Trucking Industry.” *The Value Line Publishing*, 12 March 2004.

“Unified Transport Market Takes Shape.” *The Journal of Commerce Online*, 22 December 2003.

U.S. Department of State. “Open Skies Partners.” 14 January 2004.
<<http://www.state.gov/e/eb/rls/othr/22281.htm>> (14 March 2004).

U.S. Department of Transportation. Bureau of Transportation Statistics Pocket Guide 2004.

U.S. Department of Transportation. *Strategic Plan 2003-2008, Safer, Simpler, Smarter Transportation Solutions*, September 2003.

U.S. Government Printing Office. *CJCS, Joint Vision 2020*, June 2000.

Weinberger, Sharon. “Handy: Airlift Shortage Forcing Military Tradeoffs.” *Defense Daily*, 23 March 2004.

Zuckert Scoutt & Rasenberger, L.L.P. “European Court Says “Bye Bye Bermuda.” *Aviation Advisor*. 6 November 2002. <<http://zsrlaw.com/publications/Newsletters/AA%20Nov%206%2002.htm>> (14 March 2004).